

DERWENT-ACC-NO: 1997-536341

DERWENT-WEEK: 199750

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TITLE: Heating bitumen-containing material - by granulating and mixing with hot heat-exchange material especially mixed sand and gravel

PATENT-ASSIGNEE: CONNOR D P[CONNI]

PRIORITY-DATA: 1996AU-0008600 (March 11, 1996)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
AU 9715194 A	October 23, 1997	N/A	009	C10C 003/10

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
AU 9715194A	N/A	1997AU-0015194	March 10, 1997

INT-CL (IPC): C10C003/10

ABSTRACTED-PUB-NO: AU 9715194A

BASIC-ABSTRACT:

A bitumen-containing material is crushed and mixed with a hot granular heat exchange material such that it is heated to required temperature. Preferably the heat exchange material is a mixture of sand and gravel and at 170 - 375 deg. C and the bituminous material is heated to at least 170 deg. C; further bitumen may then be added to the mixture. Apparatus includes a rotary drier through which the heat-exchange material passes for heating. Mixing may be carried out in a pug mill preheated so that materials remain heated during mixing.

USE - Production of paving material using material recovered from existing sites such as roads, airfields, sports grounds, playgrounds, footpaths, and cycle tracks.

ADVANTAGE - Effective recycling of large amounts of material recovered during, e.g. the complete re-building of a road.

CHOSEN-DRAWING: Dwg.0/1

TITLE-TERMS: HEAT BITUMEN CONTAIN MATERIAL GRANULE MIX HOT HEAT EXCHANGE MATERIAL MIX SAND GRAVEL

DERWENT-CLASS: H08 L02

CPI-CODES: H08-B; L02-D09; L02-D10;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: C1997-171549

**(12) PATENT APPLICATION**  
**(19) AUSTRALIAN PATENT OFFICE**

(11) Application No. **AU 199715194 A1**

(54) Title  
**Treatment of bitumen containing material**

(51) International Patent Classification(s)  
**C10C 003/10**

(21) Application No: **199715194** (22) Date of Filing: **1997.03.10**

(30) Priority Data

(31) Number (32) Date (33) Country  
**PN8600 1996.03.11 AU**

(43) Publication Journal Date: **1997.10.23**

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**Name not given**

Our Ref: 632823

P/00/001  
Section 29

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AUSTRALIA

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Patents Act 1990

PATENT REQUEST : STANDARD PATENT

I/We, being the person/s identified below as the Applicant, request the grant of a patent to the person/s indicated below as the Nominated Person/s, for an invention described in the accompanying standard complete specification.

Full application details follow.

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Treatment of bitumen containing material

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ASSOCIATED PROVISIONAL APPLICATION/S DETAILS

[60] Application Number/s and Date/s:  
PN8600/96 of 11 March 1996,

Drawing number recommended to accompany the abstract:

DATED this TENTH day of MARCH 1997

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Fee: \$ 280.00

S074142

10 MAR 97



AU9715194

(12) PATENT ABSTRACT (11) Document No. AU-A-15194/97  
(19) AUSTRALIAN PATENT OFFICE

- (54) Title  
TREATMENT OF BITUMEN CONTAINING MATERIAL
- (51)<sup>s</sup> International Patent Classification(s)  
C10C 003/10
- (21) Application No. : 15194/97 (22) Application Date : 10/03/97
- (30) Priority Data
- (31) Number (32) Date (33) Country  
PN8600 11/03/96 AU AUSTRALIA
- (43) Publication Date : 23/10/97
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- (57) Claim

1. A method of treating a bitumen containing material which has a bituminous component the method including a heat exchange step which includes mixing the bituminous containing material which has been crushed with a granular heat exchange material which has been heated so that heat is transferred from the heat exchange material to the bitumen containing material to cause heating thereof to a desired temperature.

Our Ref: 632823

P/00/011  
Regulation 3:2

AUSTRALIA

Patents Act 1990

ORIGINAL  
COMPLETE SPECIFICATION  
STANDARD PATENT

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Invention Title: Treatment of bitumen containing material

The following statement is a full description of this invention, including the best method of performing it known to me:-

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## TREATMENT OF BITUMEN CONTAINING MATERIAL

This invention relates generally to the treatment of material containing a bituminous component. The bituminous component can be of any suitable bituminous material such as for  
5 example asphalt, pitch, maltha, gilsonite or the like.

One particular application of the present invention relates to the production of paving material using material from existing paving sites. Examples of such sites may include roads, airfields, sports grounds, playgrounds, footpaths and cycle paths. It will be convenient to  
10 hereinafter describe the invention with reference to this particular application however it is to be understood that this is not to be considered as a limitation on the scope of the invention. It will be readily appreciated by those persons skilled in the art that the invention has wider applications.

Material used in the construction of paving may include a bituminous material such as  
15 for example asphalt and one or more of the following; aggregate road base usually in the form of rocks which forms a foundation for the road and in some instances concrete.

As roads wear through use, it is often necessary to completely replace the road. This usually involves the removal or excavation of the material used in the paving and replacing it  
20 with new paving. At present the resultant excavated material has only limited uses such as for example as land fill.

An object of the present invention is to provide an improved method and apparatus for the treatment of bitumen containing materials.  
25

According to one aspect of the present invention there is provided a method of treating a bitumen containing material which has a bituminous component the method including a heat exchange step which includes mixing the bituminous containing material which has been crushed, with a granular heat exchange material which has been heated so that heat is transferred from the  
30 heat exchange material to the bitumen containing material to cause heating thereof to a desired temperature. Preferably the temperature is about 170°C or greater.

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Preferably prior to the heat exchange step the bitumen containing material is crushed to a selected particle size. For example, the material may be crushed down to -5mm minus or 10mm minus or any other suitable size.

5      Preferably the granular heat exchange material is heated to a temperature of between 170°C to 375°C, preferably 250°C to 275°C prior to being mixed with the bitumen containing material.

10      Preferably the mixture of heat exchange material and bitumen containing material is in the ratio of about 35% heat exchange material and 65% bitumen containing material by weight. It will be appreciated that some variation of the ratio above can be used depending upon the particular application.

15      Preferably the heat exchange material comprises a mixture of gravel and sand. The gravel can be either used gravel, un-used gravel or trade waste such as for example, concrete, terracotta, glass. The composition of the gravel and sand mixture is preferably about three part gravel to two parts sand.

20      The method of the present invention may further include the step of mixing additional bituminous material with the mixture after the heat exchange step. The additional bituminous material which is added to the mixture may be about 5% by weight of additional bituminous material to about 95% by weight of the mixture.

25      Preferably the added bitumen material is 170 grade bitumen although other grades may be used.

Preferably the mixture is maintained at a selected temperature during the further mixing step.

30      In the particular application of the invention where excavated road paving materials are used, after the crushing step much of the material has surfaces which are not covered with the

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bituminous material. The heat exchange step causes the existing bituminous material to melt so that it can coat any exposed surfaces. The additional bituminous material which is subsequently added ensures that all surfaces are coated.

5 According to a further aspect of the present invention there is provided apparatus which is suitable for use in the treatment of bitumen containing material the apparatus including a heat exchange chamber means for delivering bituminous containing material to the heat exchanger chamber and means for delivering heated heat exchange material to the heat exchange chamber.

10 Preferably the heat exchange chamber is in the form of a hopper to which the various materials are fed. Preferably the apparatus further includes heating means for heating the heat exchange material prior to being fed to the heat exchanger.

The heating means may be in the form of a rotary drier through which the heat exchange  
15 material travels. Transfer of the material may be by a conveyor or the like.

Crushing means in the form of an impact crusher or the like for example may be provided for crushing the bituminous bitumen containing material to a selected size.

20 The apparatus may further include means for mixing the additional bituminous material to the mixture from the heat exchange chamber. The mixer may be in the form of a pugmill. Preferably the pugmill is heated to a preselected temperature so that the materials therein remain heated during this mixing step.

25 It will be appreciated that it is difficult to heat bituminous materials without the material catching fire. The use of granular heat exchange material alleviates this problem.

By using the above described method and apparatus with respect to the particular application concerning paving it enables large amounts of used paving material to be recycled.

30

A drawing illustrating a preferred embodiment of apparatus for use in the treatment of



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bitumen containing materials is described with reference to the drawing Figure 1 which is a block diagram of the various parts of the apparatus.

Referring to the drawing the apparatus according to a preferred embodiment of the invention includes a feed hopper 10 for receiving excavated paving material from a road or the like. The paving material generally includes asphalt, aggregate and road base. This material is fed from the feed hopper 10 to a crusher 11 which is preferably in the form of an impact crusher or the like which crushes the material to a selected size such as for example 5mm minus or 10mm minus.

10

The crusher material is transferred to a storage hopper 12. The material may be transferred by a conveyor the like although this is not essential.

Heat exchange material in the form of a mix of gravel and sand is stored in storage hopper 13. The gravel may be previously used gravel or unused gravel.

The materials in the storage hoppers 12 and 13 is delivered to a heat exchange chamber 15 in the form of a mixing hopper. The heat exchange material is passed through heating apparatus 14 which may be in the form of a rotary dryer which heats the material to a desired temperature. Metering devices 17 control the ratio of the materials being fed from the two storage hoppers 12 and 13. Such metering devices may be in the form of electric variable drives.

The materials in the heat exchange chamber 15 are mixed together and heat in the heat exchange material is transferred to the other material heating it to a desired temperature such as for example 175°C.

The heated mixture of materials transferred to a further mixing device 18 which may be in the form of a pugmill. The pugmill and if necessary the heat exchange chamber are heated so as to maintain the material mixture at a desired temperature. Heating may be effected by oil, electricity, gas or the like. Conveyors can be used to transfer the material from each operating station i.e. from feed hoppers 12 and 13 to the heat exchange chamber 15 (in one line via rotary

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dryer 14) and on to the pugmill 18.

At this stage additional bitumen such as asphalt is added to the mixture hereafter the final material is delivered to a discharge hopper 19.

5

The resultant mixture can be used as a component material for use in the construction of new paving.

Finally, it is to be understood that various alterations, modifications and/or additions may  
10 be incorporated into the various constructions and arrangements of parts without departing from the spirit or ambit of the invention.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of treating a bitumen containing material which has a bituminous component the method including a heat exchange step which includes mixing the bituminous containing  
5 material which has been crushed with a granular heat exchange material which has been heated so that heat is transferred from the heat exchange material to the bitumen containing material to cause heating thereof to a desired temperature.
2. A method according to claim 1 wherein the desired temperature is about 170°C or  
10 greater.
3. A method according to claim 1 or claim 2 wherein prior to the heat exchange step the bitumen containing material is crushed to a selected particle size.
- 15 4. A method according to claim 3 wherein the material is crushed to a size from 5mm minus to 10mm minus.
5. A method according to any preceding claim wherein the granular heat exchange material is heated to a temperature of from 170°C to 375°C, prior to being mixed with the  
20 bitumen containing material.
6. A method according to claim 5 wherein the temperature is from 250°C to 275°C.
7. A method according to any preceding claims wherein the mixture of heat exchange  
25 material and bitumen containing material is in the ratio of about 35% heat exchange material and 65% bitumen containing material by weight.
8. A method according to any preceding claim wherein the heat exchange material comprises a mixture of gravel and sand.
- 30 9. A method according to claim 8 wherein the composition of the gravel and sand mixture

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is about three part gravel to two parts sand.

10. A method according to any preceding claim further including the step of mixing additional bitumen with the mixture after the heat exchange step.

5

11. A method according to claim 10 wherein the additional bitumen which is added to the mixture is about 5% by weight of additional bitumen to about 95% by weight of the mixture.

12. A method according to claim 10 or 11 wherein the added bitumen is 170 grade bitumen.

10

13. A method according to any one of claims 10 to 12 wherein the mixture is maintained at a selected temperature during the further mixing step.

14. Apparatus which is suitable for use in the treatment of bitumen containing material the  
15 apparatus including a heat exchange chamber means for delivering bituminous containing material to the heat exchanger chamber and means for delivering heated heat exchange material to the heat exchange chamber.

15. Apparatus according to claim 14 wherein the heat exchange chamber includes a hopper  
20 to which the materials are fed.

16. Apparatus according to claim 14 or claim 15 including heating means for heating the heat exchange material prior to being fed to the heat exchanger.

25 17. Apparatus according to claim 16 wherein the heating means includes a rotary drier through which the heat exchange material travels.

18. Apparatus according to any one of claims 14 to 17 further including crushing means for crushing the bitumen containing material to a selected size.

30

19. Apparatus according to any one of claims 14 to 18 further including means for mixing

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the additional bitumen to the mixture passing from the heat exchange chamber. The mixer may be in the form of a pugmill.

20. Apparatus according to claim 19 wherein the mixing means includes a pugmill which is  
5 heated to a preselected temperature so that the materials therein remain heated during this mixing step.

21. A method of treating bitumen containing material substantially as hereinbefore described with reference to the accompanying drawings.

10

22. Apparatus for treating bitumen containing material substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 10th day of March, 1997

15 **DAREN PAUL CONNOR**

By His Patent Attorneys

DAVIES COLLISON CAVE

## ABSTRACT

5

A method of treating a bitumen containing material which has a bituminous component including a heat exchange step which includes mixing the bituminous containing material which has been crushed with a granular heat exchange material which has been heated so that heat is transferred from the heat exchange material to the bitumen containing material to cause heating  
10 thereof to a desired temperature.

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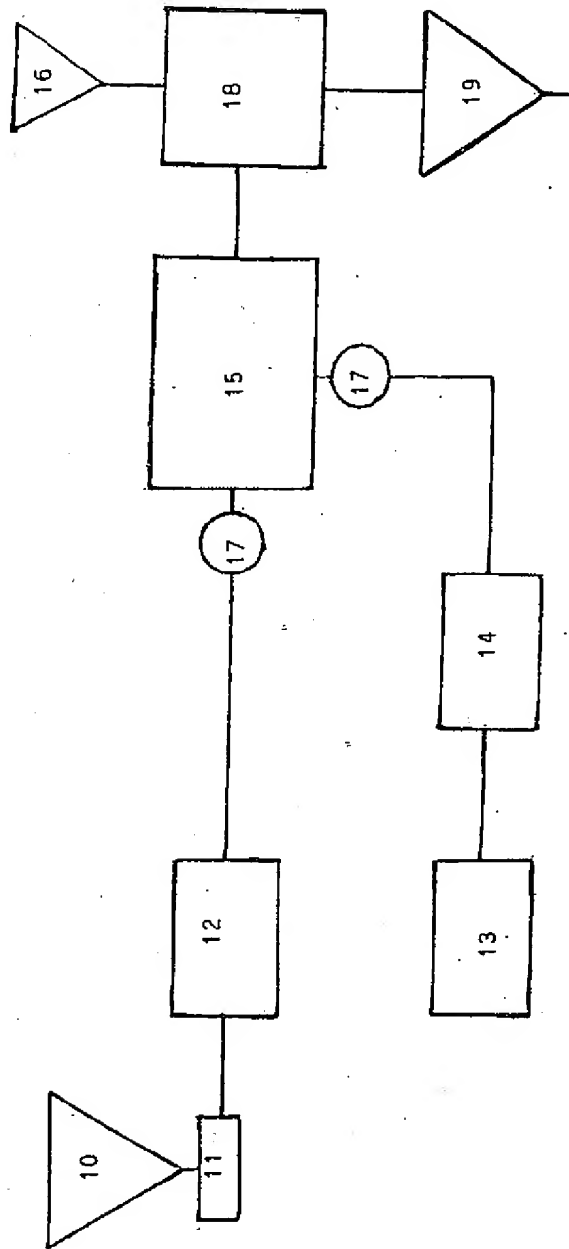


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